

and surface-elevations, or even their absence or presence, is not sufficient to distinguish species, as shown by Thwaites\*, &c. and Shadbolt†. The observations of Ralfs‡ upon *Himantidium* are very interesting in this respect, although unfortunately very incomplete.

It may be remarked, that the surface of the valves of the *Navicula* described above were covered with minute depressions, invisible by ordinary illumination, but visible by oblique light with the use of stops; while the sporangial sheath was free from markings, save the transverse striæ.

The manner in which the unyielding siliceous sporangial sheath enlarges in accordance with the growth of the sporangial frustule is obscure, unless it ensue by the occasional ecdysis, as it might be called, of the old sheath and the formation of a new. In the earliest conjugating specimen observed of the above *Navicula*, the sporangial sheath was of a rounded-oblong form, about two-thirds of the size of the parent frustules, and situated midway between them, both in regard to length and breadth, whilst the full-grown sporangial frustule and sheath were twice the length of the parent frustule (figs. 2 & 3), both the former being of about the same size, and the latter situated near one end of the sporangial sheath. It was noticed also, that all the sporangial frustules were undergoing division, although contained within their sheaths.

VIII.—*On a New Genus of Fossil Cidaridæ, with a Synopsis of the Species included therein.* By THOMAS WRIGHT, M.D., F.R.S.E.

NOTWITHSTANDING the many new generic sections introduced into the classification of Echinoderms, by MM. Agassiz and Desor, and the important light thrown by these savans on our knowledge of the numerous species of this class contained in European collections, still the progress of discovery renders it imperative on palæontologists to modify from time to time many of the opinions put forward by these authors in their ‘Catalogue raisonné.’ When the amount of real work done by them is taken into account, in a field which was then comparatively unknown, the wonder is, not that mistakes or oversights should have been committed, but that so much good work

\* Annals, *loc. cit.*

† Shadbolt, *Microsc. Journal*, vol. iii.

‡ Ralfs, *Annals*, 1843, xii. on *Fragilaria pectinalis*, R. (*Himantidium pectinale*, Kütz.) var.  $\beta$ .

under the circumstances should have been attained, which will bear the most severe criticism, and remain as it was left, a monument of the genius and industry of the authors.

In our memoirs on the Cidaridæ of the Oolites, we have figured and described three species, *Goniopygus perforatus*, *Pedina Etheridgii* and *Pedina Bakeri*; the true generic position of these forms seemed to us uncertain at the time our papers were passing through the press, as they exhibited characters which did not assimilate with either of the generic divisions of the 'Catalogue raisonné.' Our materials did not then justify us in proposing a separate genus for their reception; the discovery, however, of an interesting series of new congeneric forms has now enabled us to rectify our determination, and propose the genus *Hemipedina* for the group, to which we have added a synopsis of the species included therein.

#### HEMIPEDINA, Wright, 1855.

This new genus is composed of small, neat, and highly ornamented Urchins, much depressed on their upper surface, and with a flat or slightly concave base. The ambulacral areas are narrow and straight; the pores in the poriferous zones are arranged in single pairs; the interambulacral areas are in general more than double the width of the ambulacral, with two, four, or six rows of tubercles in general arranged abreast on the same tubercular plate. The tubercles are perforated, and set on mammillary eminences with smooth uncrenulated summits; one row of tubercles in general only extends from the peristome to the disc; the other rows, when there are four and six rows in the area, stop short at the equator, or between the equator and the disc; the intertubercular space on the upper surface of the test is therefore in general wide, and covered with a small miliary granulation. The apical disc is large; the genital and ocular plates are expanded and foliated. The mouth-opening is of moderate dimensions, and the peristome is divided into ten nearly equal-sized lobes. The spines are long, slender, and needle-shaped; those that are known, equal at least the diameter of the test, and their surface is sculptured with delicate longitudinal lines.

*Hemipedina* is related to *Diadema* in having the pores arranged in the zones in single pairs and the tubercles perforated; but it is distinguished from *Diadema* by the absence of crenulations on the summits of the mammillary eminences. It is related to *Pedina* in possessing perforated and uncrenulated tubercles; but it is distinguished from that genus in having the pores in the zones in single pairs (*Pedina* having the pores in triple oblique pairs like *Echinus*), in having the elements of the

apical disc more largely developed, and in the species being nearly all small and depressed forms. *Hemipedina* is related to *Echinopsis* in possessing uncrenulated and perforated tubercles, with the pores in pairs; but it is distinguished from the latter by the narrowness of the ambulacral areas, the depressed form of the test (*Echinopsis* being high and inflated), the form of the mouth-opening, and the deep decagonal lobes of the peristome (that of *Echinopsis* being almost deprived of these incisions), together with the greater size and development of the elements of the apical disc.

*Hemipedina*, as far as we at present know, is composed of Jurassic species, which commence in the lower Lias and extend into the Coral Rag, each stage possessing its own specific forms. The following synopsis of the British species now before us will be figured and described in detail in our Monograph on the British Oolitic Cidaridæ.

#### A. *Species from the Lias.*

##### *Hemipedina Bechei*, Wright.

*Cidaris Bechei*, Broderip, Geol. Proc. ii. 202.

*Diadema Bechei*, Agassiz, Morris's Catalogue of British Fossils, 1st ed. p. 51.

Test small, much crushed, and covered over with spines; ambulacra with two rows of tubercles; interambulacra with four or six rows of tubercles; spines long, slender and needle-shaped,  $\frac{9}{10}$ ths of an inch in length, with longitudinal lines on the surface. This appears to be identical with the type-specimen in the Museum of the Geological Society.

*Locality*.—Lower Lias, Lyme Regis.

*Coll.* J. S. Bowerbank, Esq.

##### *Hemipedina Bowerbankii*, Wright, nov. sp.

Test crushed,  $1\frac{1}{20}$ th of an inch in diameter; ambulacral areas narrow, with two rows of marginal tubercles rather smaller than those in the interambulacra, a tubercle on every alternate plate; interambulacral areas wide, with six rows of tubercles abreast, surrounded by a delicate scrobicular circle; spines shorter and thicker ( $\frac{1}{20}$ ths of an inch in length) than those of *H. Bechei*, although the test is much larger, deeply sculptured with longitudinal lines.

*Locality*.—Lower Lias, Lyme Regis.

*Coll.* J. S. Bowerbank, Esq.

*Hemipedina Jardinii*, Wright, nov. sp.

Test small, much depressed; ambulacral areas wide, with two rows of marginal tubercles which extend from the peristome to the disc; interambulacral areas with two rows of tubercles set near the poriferous zones, from eleven to twelve tubercles in each row, a delicate scrobicular circle of granules around each, and a naked intertubercular space in the centre; mouth-opening small, situated in a depression; peristome decagonal; base finely radiated in consequence of the size and regularity of the interambulacral tubercles.

*Locality*.—Marlstone near Ilminster, Somersetshire, and Breton Hill, Gloucestershire.

*Coll.* of the late H. Strickland Esq., and Dr. Wright.

*Hemipedina Etheridgii*, Wright.

*Pedina Etheridgii*, Wright, *Annals of Nat. Hist. S. 2.* vol. xiii. p. 315. pl. 1. fig. 5 a-d.

Test small, circular, depressed; ambulacral areas narrow, with six small perforate tubercles below, and a double row of marginal granules above; interambulacral areas with two rows of tubercles, seven in each row; apical disc large and petaloidal; mouth-opening small; peristome decagonal; lobes nearly equal.

*Locality*.—Upper Lias, Ilminster.

*Coll.* Dr. Wright.

B. *Species from the Inferior Oolite.**Hemipedina Bakeri*, Wright.

*Pedina Bakeri*, Wright, *Annals of Nat. Hist. S. 2.* vol. xiii. p. 312. pl. 1. fig. 4 a-c.

Test circular, depressed; ambulacral areas very narrow, with two rows of small tubercles set so far apart that they form a zig-zag row; interambulacral areas with two rows of rather large prominent tubercles, five in a row; apical disc with a prominent anal rim; mouth-opening large; peristome deeply decagonal.

*Locality*.—Pea-grit, Inferior Oolite, Crickley Hill.

*Coll.* Dr. Wright: a single specimen.

*Ann. & Mag. N. Hist. Ser. 2. Vol. xvi.*

*Hemipedina perforata*, Wright.

*Goniopygus*? *perforatus*, Wright, Annals of Nat. Hist. S. 2. vol. viii. p. 267. pl. 6. fig. 5 a-b.

Test small, circular and depressed; ambulacral areas with two rows of small tubercles which extend from the peristome to the disc; interambulacral areas with two rows of tubercles, seven to eight in each row, three or four secondary tubercles between the primary rows at the base; surface of the plates covered with numerous coarse miliary granules; mouth-opening large; peristome rather deeply decagonal; lobes nearly equal in size; apical disc large and foliated.

*Locality*.—Pea-grit, Inferior Oolite, Crickley Hill.

*Coll.* Dr. Wright.

*Hemipedina tetragramma*, Wright, nov. sp.

Test circular,  $\frac{9}{10}$ ths of an inch in diameter; ambulacral areas narrow, with two marginal rows of small nearly equal-sized tubercles extending from the peristome to the disk; interambulacral areas with two rows of primary tubercles, about fourteen in each row, and two rows of secondary tubercles, ten in each row, extending from the peristome to nearly the upper surface; mouth-opening small, situated in a depression; peristome decagonal, unequally lobed.

*Locality*.—Pea-grit, Crickley Hill.

*Coll.* Dr. Wright.

*Hemipedina Waterhousei*, Wright, nov. sp.

Test small, pentagonal, rather inflated at the sides; ambulacral areas with two rows of small tubercles extending from the peristome to the disc; interambulacral areas with two rows of tubercles, eight in a row; scrobicular circles neatly defined; mouth-opening small; apical disc narrow and prominent.

*Locality*.—Pea-grit, Inferior Oolite, Crickley Hill.

*Coll.* Dr. Wright.

*Hemipedina Bonei*, Wright, nov. sp.

Test small, pentagonal, depressed; ambulacral areas with two marginal rows of close-set tubercles; interambulacral areas with one entire row and four short rows of tubercles, which extend only as far as the equator; tubercles of both areas about the same size; base flat; mouth moderate in dimensions; peristome unequally decagonal; apical disc absent.

*Locality*.—Pea-grit, Crickley Hill.

*Coll.* Dr. Wright.

C. Species from the Great Oolite and Cornbrash.

*Hemipedina Davidsoni*, nov. sp.

Test much depressed, 1 inch in diameter; ambulacral areas with two rows of marginal tubercles very regular in their arrangement throughout; interambulacral areas wide, with two rows of primary tubercles, fourteen in a row, and two rows of secondary tubercles which extend beyond the equator, between the former, and two rows of smaller tubercles between the main rows and the poriferous zones, so that at the equator there are six rows of tubercles abreast, whilst on the upper surface there are only two rows; mouth-opening small, in a concave depression; peristome decagonal and nearly equally lobed; apical disc absent.

*Locality*.—The sandy beds of the Great Oolite, Minchinampton.

*Coll.* Dr. Wright: only one specimen known.

*Hemipedina Woodwardii*, Wright, nov. sp.

Test circular, much depressed; ambulacral areas narrow, with two rows of small tubercles below and extending as far as the equator, diminishing to granules on the upper part of the areas; interambulacral areas with two rows of rather large primary tubercles, eight in a row, and two rows of secondary tubercles, three to four in each row, which scarcely reach the equator, the upper part of the intertubercular space being filled with a small, abundant miliary granulation; apical disc large, anal rim prominent; mouth-opening small; peristome decagonal, nearly equal-lobed.

*Locality*.—Cornbrash, Wiltshire.

*Coll.* British Museum, from Dr. Smith's collection; Dr. Wright.

*Hemipedina tuberculosa*, Wright, nov. sp.

Test elevated, subconoidal?, the precise form unknown; ambulacral areas with two rows of basal semitubercles raised on very prominent bosses diminishing rapidly in size into coarse granules above; interambulacral areas with two rows of large tubercles set on very prominent bosses, with scrobicular circles of coarse granules surrounding the areolas; two rows of small secondary tubercles close to the poriferous zones from the peristome to the equator, and three or four at the base of the intertubercular space; upper surface enveloped in the matrix; apical aperture large.

*Locality*.—Coral Rag, Wiltshire.

*Coll.* British Museum.

*Foreign Species of the genus Hemipedina.*

*Hemipedina seriale*, Wright.

*Diadema seriale*, Agassiz ; Leymerie, Mém. de la Société Géologique de France, tome ii. p. 330. pl. 24. fig. 1, 1839 ; Agassiz and Desor's Cat. raisonné des Echinides, 3 sér. tome vi. p. 348.

Test hemispherical, subglobose above, flat below ; ambulacral areas with two rows of tubercles nearly as large as those of the interambulacra ; interambulacral areas with six rows of tubercles abreast at the equator, diminishing to four and two rows above ; a few secondary tubercles unequally distributed ; mouth-opening small ; peristome slightly decagonal.

*Locality*.—Inferior Lias, France.

*Coll.* M. Michelin.

*Hemipedina Woodwardii*, Wright.

This species occurs in the Cornbrash of the Marquise, near Boulogne-sur-Mer. In one of the specimens before us the spines are preserved ; the primary spines are not very long, scarcely the length of the diameter of the test ; the secondary spines are short and needle-shaped ; the surface of both kinds is covered with fine longitudinal lines.

*Locality*.—The Cornbrash near Boulogne-sur-Mer.

*Coll.* British Museum.

*Hemipedina Nattheimense*, Wright.

*Echinopsis Nattheimense*, Quenstedt, Handbuch der Petrefactenkunde, p. 582. pl. 49. fig. 37.

*Locality*.—White Jura, Nattheim.

*Coll.* British Museum. At this moment the specimen is not at our disposal. We shall give a diagnosis of this species in our Monograph.

*Hemipedina Sœmanni*, Wright, nov. sp.

Test small, hemispherical ; ambulacra with two rows of tubercles ; interambulacral areas with one row of primary and two rows of secondary tubercles, the primary tubercles alternating with the secondary tubercles, not placed abreast as in most of the species ; tubercles of both areas nearly the same size.

*Locality*.—Coral Rag, Commercy, Meuse.

*Coll.* Dr. Wright : sent by M. Louis Sœmann of Paris.